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Specification

Device for Supporting and Adjusting a Form Cylinder in a Printing Group of a Rotary Printing Press

The invention relates to a device in a printing group of a rotary printing press, having a forme cylinder, a transfer cylinder and a counter-pressure cylinder, in accordance with the preambles of claims 1 or 4.

Cylinders of a rotary printing press having so-called bearer rings are known from DE 29 26 570 C2 and DE 196 01 243 A1, wherein the bearer rings of adjoining cylinders are supported on each other. Bearer rings are support elements designed as barrel rings arranged on the journals of cylinders and supporting the two ends of the cylinder in order to reduce undesired cylinder vibrations and in this way to make possible clean printing in spite of groove beat, wherein the bearer rings are of such dimensions that the bearer rings arranged on cooperating adjoining cylinders roll off on each other. Thus a defined shaft distance between two printing group cylinders of a rotary printing group is also achieved by means of a bearer ring arrangement. Because of their support of the cylinders, which exists in addition to the seating of the cylinders, the bearer rings cause dampening of cylinder vibrations excited in the course of the rotation of the cylinders by grooves, which have necessarily been cut into the cylinders for holding dressings.

As can be seen from DE 28 02 153 A1, the bearer rings are pushed together under considerable pressure in order to prevent the bearer rings, which run off on each other, from lifting or sliding off during the printing process.

An arrangement for setting the contact pressure between cylinders of a rotary printing press is known from DD-PS 113 187, wherein the arrangement for plate cylinder adjustment is constructed analogously to that for printing cylinder adjustment.

Document DE 41 42 791 A1 relates to a device for setting the printing pressure, as well as the print-on and print-off setting of printing presses, which can be selectively operated with bearer ring or without bearer ring contact, wherein the device makes possible a common, synchronous adjustment of several cylinders in respect to each other in a single adjustment process while printing with the bearer rings in contact, as well as with the bearer rings out of contact. In particular, with a change of the printing pressure between the rubber blanket and printing cylinders, the plate cylinder is moved to follow the rubber blanket cylinder in such a way that, independently of the printing gap between the rubber blanket and the printing cylinders, the shaft distance between the plate cylinder and the rubber blanket cylinder always remains the same.

The object of the invention is based on providing a device with a forme cylinder, a transfer cylinder and a counter-pressure cylinder in a printing group of a rotary printing press.

In accordance with the invention, this object is attained by means of the characterizing portion of claims 1 or 4.

The advantages to be gained by the invention reside in particular in that, in the course of setting and adjustment, the contact pressure required between the forme cylinder and the transfer cylinder, support elements between these cylinders, which correspond with each other and limit the adjusting path, need not be taken into consideration. Since support elements customary in printing groups, for example in the form of bearer rings, are mostly put into contact under prestress, a considerably reduced force is required for setting and adjustment if they are omitted at the forme cylinder. Thus, appropriate drive mechanisms and force transfer devices can be designed with lower output, which leads to savings of cost and energy. Setting the contact pressure between the forme cylinder and the transfer cylinder is therefore lastingly made easier if no support elements exist at the forme cylinder. On the other hand, the support elements remain in those locations where they are needed, for example between the transfer cylinder and the counter-pressure cylinder. Support elements are required at this location, because clamping grooves formed in the transfer cylinder are the main cause of the so-called groove beat. The transfer cylinder should therefore remain supported for increasing its quiet running. The proposed design of a printing group has particular advantages in cases where the forme cylinder is covered by a printing forme coated with silicon. The durability of the printing forme applied to a forme cylinder is increased because of the improved

adaptability of the contact pressure between the forme cylinder and the transfer cylinder, which applies in particular to waterless offset printing wherein, because of the proposed capability of adjustment of the contact pressure, the print quality which can be achieved by means of the printing forme can be in addition improved even during the ongoing printing process. Moreover, lubrication and cleaning of the bearer rings arranged between the forme cylinder and the transfer cylinder, which would otherwise be required, is omitted.

The sole drawing figure is a simplified representation of a printing group with a forme cylinder, a transfer cylinder and a counter-pressure cylinder.

A planographic printing process, in particular a printing group operating by means of waterless offset printing, is assumed. A print position of a rotary printing press arranged in the printing group is formed by a cylinder 01 which, for example, is embodied as a counter-pressure cylinder 01, and another cylinder 02 which, for example, is embodied as a transfer cylinder 02. A material to be imprinted, for example a paper web (not represented), is conducted between these two cylinders 01, 02. These cylinders 01, 02 are provided at both ends of their barrels 03, 04 with respective support elements 06, 07, for example bearer rings 06, 07, wherein each barrel 03, 04 has a length L. The bearer rings 06,07 of adjoining cylinders 01, 02 roll off in pairs on each other. The cylinders 01, 02 are provided with journals 08, 09, which are seated by means of bearings 12, 12 in lateral frames 13, 14. A shaft distance a1, for example a1 = 400 mm, between the rotary shafts 16, 17

of the two cylinders 01, 02 can be changed in that, for example, at least one cylinder 01, 02 is arranged to be pivotable or displaceable. At least one forme cylinder 21 with a rotary shaft 22, also seated in the lateral frames 13, 14, preferably in eccentric bushings 18, 19, is assigned to the transfer cylinder 02, wherein the rotary shaft 22 of the forme cylinder 21 and the rotary shaft 17 of the transfer cylinder 02 have a shaft distance a2 in respect to each other, which can be set and, if required, adjusted as needed.

On its surface area 23, the forme cylinder 21 can have, for example, four printing formes 26 to 29. The printing formes 26 to 29 can be designed as printing plates, for example, in particular as waterless planographic printing formes, which are placed onto the surface area 23 and are maintained in grooves 24 cut into the forme cylinder 21. The covering of the forme cylinder 21 can for example be such that respectively two printing formes 26 and 27, or 28 and 29 (the latter printing forme 29 is not represented, since in this representation it is located on the back of the forme cylinder 21), are arranged next to each other in the circumferential direction, wherein the side-by-side arranged printing formes 26 and 27, or 28 and 29, are each offset in respect to the other by 90°. On its surface area 31, the transfer cylinder 02 has one or several printing blankets 32, which are also preferably maintained in one or several grooves 24 cut into the surface area 31 and are, if required, arranged offset at the circumference of the transfer cylinder 02.

The above mentioned printing location can for example be arranged in a four-cylinder printing group, wherein the

counter-pressure cylinder is also designed as a transfer cylinder, wherein a further, non-represented forme cylinder is assigned to this transfer cylinder in such a way that these two cylinders run off on each other. This printing group can also be expanded into an eight-part tower. However, it is also possible to employ the previously described printing locations in connection with a counter-pressure cylinder in a five-cylinder printing group, for example, a ten-cylinder printing group consisting of two five-cylinder printing groups, or a nine-cylinder printing group.

The printing group here described is operated in a planographic printing process and preferably uses a printing forme suitable for waterless offset printing ("dry offset printing"). The expression "waterless offset printing" identifies a printing group without a dampening system, i.e. no supply of a dampening agent for forming the non-printing areas is required in addition to the supply of printing ink. With waterless offset printing the application of a film of moisture to the printing forme is omitted, which otherwise, in so-called "wet offset printing", prevents the non-printing portions on the printing forme from picking up printing ink. In waterless offset printing this is achieved by the use of special printing inks and a special design of the surface of the printing forme.

A printing forme suitable for waterless offset printing preferably has a support layer, or a substrate, which can be made of aluminum and have a suitable thickness for achieving the desired mechanical properties. An ink-accepting layer is applied to this, as well as an ink-rejecting layer above the

latter. The ink-accepting layer can be embodied as a polyethylene film. Its thickness can lie in the range between 5 and 50 μm, it preferably is approximately 20 μm. The ink-rejecting layer consists for example of silicon. Its thickness is suitably selected. It can lie within the range of a few μm, for example at approximately 2 μm. In waterless offset printing the silicon layer takes over the role of the hydrophilic layer in wet offset printing, which can be covered by a dampening agent and prevents the printing forme from picking up ink. An adhesive or base layer can lie between the substrate and the ink-accepting layer, for example a titanium oxide layer. In USP 5,487,338, a printing forme suitable for waterless offset printing of the Presstek company (PearlDry) is described by way of example.

In waterless offset printing the problem sometimes occurs that, because of the lack of dampening agent, an increased temperature can possibly occur in the printing group, which is too high for the printing process, or for the printing inks used, for which reason it has been proposed in EP 652 104 A1, to control the temperature of the surface of cylinders in a printing group for waterless offset printing. Moreover, in a printing group without dampening agent, soiling from dust and rubbed-off material to be imprinted, as well as from ink residue, can be very problematic, because cleaning of the cylinders otherwise performed by the dampening agent no longer exists. Accordingly, with too strong a contact pressure between the forme cylinder and the transfer cylinder, wherein the force creating the contact pressure can be approximately 10 N per cm of barrel length, the danger of grinding exists. For these reasons, and in

view of the rather reduced mechanical strength and reduced temperature resistance of the printing formes for waterless offset printing in comparison with conventional printing formes, which are mostly completely made of an aluminum alloy, it is necessary to design the printing group in such a way that the contact pressure between the forme cylinder and the transfer cylinder can be changed in connection with the properties of a waterless printing form and thus can be adapted as needed. In this case the adaptability takes place in particular in respect to the property of pressure stressing of the printing forme, but it can also be related to the temperature stressing or surface hardness, in particular scratch resistance, and therefore wear resistance of the printing form. Furthermore, the frictional heat caused by the contact pressure has an effect on the behavior of the printing ink used in the printing process, in particular its flowability and adhesion to the printing form, and finally on the material to be imprinted, and therefore the print quality, so that the setting and adjustment of the contact pressure can also take place by taking these process parameters into consideration. Furthermore, with some applications it can be useful to control the temperature of the forme cylinder 21 in addition to the described steps, wherein a temperature-control medium flows through at least one cooling conduit, preferably several such cooling conduits, arranged in the forme cylinder 21, wherein the at least one cooling conduit is preferably arranged closely underneath the surface area 23 of the forme cylinder 21.

The contact pressure between the forme cylinder 21 and the transfer cylinder 02 can be adapted by means of the shaft

distance a2 between the forme cylinder 21 and the transfer cylinder 02 being changeable. Thus, the shaft distance a2 has different values at different contact pressures, so that during the printing process the forme cylinder 21 can be in different positions in relation to the transfer cylinder 02. This adaptation can be easily performed if the forme cylinder 21 does not have a support element 06, 07 cooperating with the transfer cylinder 02. Such a support element 06, 07 arranged on the forme cylinder 21 would limit the adjustment possibilities of the forme cylinder 21, or would at least make them considerably more difficult. On the other hand, support elements 06, 07, for example in the form of bearer rings 06, 07, have been arranged at the same time between the transfer cylinder 02 and the assigned counter-pressure cylinder 01, in particular for improving the quiet running of the transfer cylinder 02. The contact pressure between the forme cylinder 21 and the transfer cylinder 02 can also be set, preferably during the ongoing printing process, in particular by remote control from a command console assigned to the printing press, by means of a change of their shaft distance a2, and can be adjusted in regard to a contact pressure which is optimal in respect to the durability of the printing formes 26 to 29 and the print quality.

It is advantageous that the rotary shaft 22 of the forme cylinder 21 is in operative connection with at least one eccentric bushing 18, 19, a lever arrangement, or a linear drive mechanism, by means of which the forme cylinder 21 can be placed against the transfer cylinder in a needed way. However, an eccentric cylinder bearing without bushings can be used in place of the eccentric bushing 18, 19. In a

printing group designed in this way the support element 07 of the transfer cylinder 02 and the support element 06 of the counter-pressure cylinder 01 are preferably still arranged so that they roll off on each other, wherein it is of advantage that the transfer cylinder 02 and the counter-pressure cylinder 01 can be distanced from each other, for example by pivoting or by traveling a displacement path. Thus, as indicated in the sole drawing figure by the directional arrows 33 and the seam 34 in the lateral frames 13, 14, the portion of the lateral frames 13, 14 in which the counter-pressure cylinder 01 is seated can be designed to be movable in respect to the remaining parts thereof, for example for conducting a web of a material to be imprinted, for example a paper web, between the counter-pressure cylinder 01 and the transfer cylinder 02. In this way the setting of the shaft distance a1, and therefore of the contact pressure between the counter-pressure cylinder 01 and the transfer cylinder 02, is independent of the setting of the shaft distance a2 and therefore of the corresponding contact pressure between the transfer cylinder 02 and the forme cylinder 21. As already mentioned, the counter-pressure cylinder 21 can also be designed as a transfer cylinder and can form a further printing location together with a further forme cylinder.

List of Reference Symbols

01	Cylinder, counter-pressure cylinder
02	Cylinder, transfer cylinder
03	Barrel (01)
04	Barrel (02)
05	-
06	Support element, bearer ring (01)
07	Support element, bearer ring (02)
08	Journal (01)
09	Journal (02)
10	-
11	Bearing (01)
12	Bearing (02)
13	Lateral frame
14	Lateral frame
15	-
16	Rotary shaft
17	Rotary shaft
18	Eccentric bearings, eccentric bushings
19	Eccentric bearings, eccentric bushings
20	-
21	Cylinder, forme cylinder
22	Rotary shaft (21)
23	Surface area (21)
24	Groove
25	-
26	Printing forme
27	Printing forme

28	Printing forme
29	Printing forme
30	-
31	Surface area (02)
32	Printing blanket
33	Directional arrows
34	Seam
a1	Shaft distance (16, 17)
a2	Shaft distance (17, 22)
L	Length (03, 04)